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Adaptive Changes in the Digestive System During Exposure to Spaceflight Factors

18400462 Moscow VESTNIK AKADEMII NAUK
MEDITSINSKIKH NAUK in Russian No 1, Jan 89
pp 85-89

[Article by K. V. Smirnov, Institute of Medical-Biological Problems, Ministry of Health of the USSR, Moscow]

[Text] The digestive system is a multifunctional physiological system whose multifaceted activity is not limited to hydrolysis and transport of nutritive substances. I. P. Razenkov advanced the concept of the gastrointestinal tract as an active apparatus of metabolism.² Modern scientific discoveries made it possible to detail and elaborate on this view and to postulate that the maintenance of normal functions involves not only supplying the body with the necessary nutrients but also with a normal flow of physiologically active substances.⁹⁻¹¹

Constant exchange between the enteral environment and the blood is one of the mechanisms of maintaining homeostasis of the body's internal environment.¹ The activities of the gastrointestinal tract are controlled by a complex set of neurohumoral regulation mechanisms; an important role in the fine coordination of digestive functions and metabolism belongs to the gastrointestinal hormonal system, especially when there are adaptive changes in extreme conditions.

The condition of the digestive system and the direction of its readjustments can be properly estimated on the basis of many indicators that make it possible to characterize various processes as integrative responses. Studies by Razenkov of the activity of the digestive system under extreme conditions remain to this date the foundation for understanding how the digestive system adapts to new habitats.

In the past 25 years a new direction in gastroenterology has emerged and established itself: space gastroenterology.

These studies were begun and continue to be conducted by the laboratory of gastroenterology of the Institute of Medical-Biological Problems of the USSR Ministry of Health. Comprehensive studies of secretory and motor functions of the gastrointestinal tract and mechanisms of their change are conducted in environments where the subjects are exposed to spaceflight factors.³⁻⁸

The state of a cosmonaut's digestive system is estimated by noninvasive methods, such as electrogastrography and evaluation of the level of digestive enzymes in the blood, the urine and the feces. The activity of hydrolases in blood, urine and feces characterizes sufficiently the functions of the stomach, the pancreas and the small intestine.

Short Spaceflights

Studies after short (7-8 days) spaceflights and during simulation experiments established that digestive system response was of an adaptive nature.

Since the digestive system is closely connected with the nervous and endocrine systems, it is of interest to study the activity of digestive organs in the early stages of body adaptation to weightlessness, when the sympathoadrenal system is activated.

Considerable factual data were sufficient for a statistical analysis of the results, which revealed regularities in the functioning of the gastrointestinal tract during early stages of a cosmonaut's adaptation to flight.

An analysis of the internal secretion of the gastric proenzyme pepsinogen in 18 cosmonauts revealed a tendency for a rise in the level of this enzyme in the blood. At the same time, its excretion in the urine remained virtually unchanged.

A similar if inconsistent change was also observed in a study of the activity of pancreatic amylase in the blood. A study of amylase activity in the urine after flights showed no significant variation.

Studies of pancreatic protease (trypsin) activity in the blood after flights revealed a tendency for a rise in the enzyme's concentration; eight of 15 cosmonauts exhibited an increase, while in others trypsin activity either slightly declined or remained unchanged.

Ten cosmonauts exhibited an increased activity of pancreatic lipase in the blood; in others this rise was within the normal range. A slight hyperlipasemia was associated with an increased lipase activity in the urine. We believe this to indicate the adaptive nature of the change aimed at preserving a steady enzyme homeostasis in the blood.

A similar change in the gastroduodenal zone is typical for various actions of a moderate severity applied to the body, such as physical loads, heat, changed barometric pressure, etc.

A period of rapid adaptive readjustment is characterized by an additional synthesis of enzyme proteins, especially enzymes whose activity is to provide the body with plastic material and energy substrate.

Changes in the excretion of maltase—the enzyme that hydrolyzes disaccharides—were also individualized. Despite the different directions of changes, there was an overall trend for an increase.

The concentration of intestinal dipeptidase—glycylleucine dipeptidase—remained virtually unchanged after flights.

A slight rise in activity of alkaline phosphatase in the feces in some cases correlated with a higher phospholipid content.

An analysis of the data of the study of enzyme-secretory function of the gastrointestinal tract after short spaceflights was indicative of some stimulation of the secretion of digestive enzyme in the incretory pathway, and sometimes also the excretory pathway as well.

Studies of motor and evacuative functions of the stomach revealed an intensification of food evacuation from the stomach.

Activity changes of digestive enzymes in the blood are indicative of intensified enzyme synthesis by producer glands. A slight increase in nutrient hydrolysis in the gastrointestinal tract, particularly lipids, is indicated by a rise in the end-product of lipid hydrolysis in the feces. A comparison of the data after short spaceflights with studies of enzyme secretion during short immersion and antiorthostatic hypokinesia, and the combined action of overloads and immersion of hypokinesia, revealed similarities of change patterns.

After brief spaceflights, crewmembers thus experienced a short-lived activation of all enzyme systems of the gastrointestinal tract. The changes in enzyme secretion are short-lived and reflect a nonspecific stressor body response to extreme actions of spaceflight factors.

Long Spaceflights

Following a 96-day flight, the first day of the readaptation period was characterized by intensified activity of gastric pepsinogen and pancreatic lipase. A similar change was observed after short flights and was largely due to body stress response after transition to earth's gravitation.

However, in contrast to short flights, both cosmonauts had a reduction of amylolytic blood activity that was decreased by almost one-half. On the seventh day of the readaptation period, there was a slight trend for normalization of pepsinogen and lipase levels in the blood and a tendency for increased trypsin activity in the blood, which then developed into a significant rise by the 31st day.⁷

Following a 140-day flight, pepsinogen and pancreatic enzymes (amylase and trypsin) were increased in the blood.

After a 175-day spaceflight, changes in the activity of the digestive system were more pronounced than those after previous long flights. On day 1 after the flight there was a significant rise in pepsinogen, amylase, trypsin and lipase in the blood.

After a 185-day spaceflight, the change in digestive functions was less pronounced compared to the 175-day flight. The small intestine exhibited a changed membrane digestion that was of a compensatory-adaptive nature.

After a 237-day flight, the moderate activation of pepsinogen and trypsin during the first seven days was succeeded by an intensification of trypsin incretion

during the late segment of the readaptation period. There was a drop in peptidase excretion and an increase in carbohydrase excretion. The activity of alkaline phosphatase and monoglyceridolipase did not differ significantly from background values.

A comparison of the changes in digestive system function discovered after long spaceflights and modifications produced by simulations of the effects of spaceflight factors such as weightlessness, hypokinesia, overloads, various diets (particularly the onboard food rations) and stressor effects made it possible to investigate the roles of the various factors.

Changes in enzyme-secreting and motor processes in the gastrointestinal tract following long spaceflights largely replicated changes in the digestive system after a prolonged antiorthostatic hypokinesia in man.^{5,6} The physiological evaluation of onboard food rations determined no significant change in digestive function.

For estimating the nature of the changes in secretory and motor functions the indicators should be considered together in a correlation. Besides the directed character of changes in the various enzymes, the participation of particular enzymes in the evolution of functional change was indicative. For example, lipolytic and amylolytic activity during the readaptation following short spaceflights changes on the first day after landing and equally quickly becomes normalized.

After a long spaceflight, the response is slowed down but persists for a long time during readaptation. At a later stage of readaptation the trypsin enzyme system begins to respond.

During the early stages of adaptation to spaceflight factors the leading regulating mechanisms are the ones that maintain nonspecific body responses to extreme stimuli. These include the hormonal component of the sympathoadrenal system. Prolonged action of the factors intensifies acid formation and pepsin secretion. The increase of acid and pepsin secretion during adaptation to weightlessness and hypokinesia is responsible for the switch of the digestive system to a new functional level; with increasing length of spaceflight this level to some extent stabilizes.

The adaptation process is based on two principles: increasing the number of actively functioning structures in components responsible for adaptation and a high economicity of operation of other system components and the system as a whole.

The economy of the digestive system is accomplished at the enteropancreatic regulation level. The increted digestive enzymes affect digestive glands by way of the blood. Blood trypsin plays an important role in integrating the activity of the stomach and the pancreas. The action of the increted trypsin slows down the secretory function of the pancreas.

During long periods of weightlessness and hypokinesia, the higher trypsin level in the blood acts through a "feedback" to reduce its production in the pancreas and to moderate its influx into the gastrointestinal tract.

A similar direction of change in secretion and incretion during hypokinesia has been observed for amylase and lipase, leading to the general conclusion that the functional capacity of the pancreas is somewhat subdued by the long-term action of stressor factors, including weightlessness and hypokinesia. Changes in activity of intestinal enzymes responsible for final hydrolysis of nutrients are indicative of a self-regulating action of the gastrointestinal tract in the distribution of enzymatic activity as the digestive system becomes adapted to a spaceflight environment.

The conditions in which the spaceflight factors operate to some extent determine the depth of the alteration observed in the digestive system.

The initial functional status of an organ and the system as a whole is essential for the form of change in the digestive system during spaceflight. An important role in the development of functional modifications of the digestive system also belongs to the cosmonaut's training to withstand extreme spaceflight factors.

To summarize, the leading mechanisms during the early stages of adaptation to spaceflight are the regulating mechanisms of nonspecific body responses. Prolonged action of the factors intensifies stomach acidity and pepsin secretion, causing the digestive system to make a transition to a new functional level.

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UDC 612.821:358.43

Assessment of Psychophysiological Reserve Potential of Pilots

18400566C Moscow VOYENNO-MEDITSINSKIY
ZHURNAL in Russian No. 2, Feb 89 pp 46-49

[Article by A. V. Shakula, cand. med. sci., major, Med. Corps, and A. D. Klyunk, capt., Med. Corps]

[Abstract] A method has been devised for assessment of the psychophysiological reserve potential of pilots and, accordingly, their potential performance efficiency relying on an exercise cycle stress test. The technique utilizes exercise cycle KYe-11 and the physiological monitoring Fiziolog-M apparatus in conjunction with performance of simple and complex sensorimotor tasks. In the testing procedure the physical load during sensorimotor tasks is set at 100 W, which has been shown to reveal occult cardiac insufficiency in 14 to 50 year olds. When the subject is into the 5th to 6th minute of the stress test the first and second programs of the "Rezerva" block are carried out. Studies on three groups of pilots 1-6, 7-9, and 10-12 months after discharge demonstrated that the highest level of psychophysiological reserve were shown by the first group, a parameter diminishing in direct proportion to the time elapsed from active duty. Electrotranquilization with Lenar apparatus improved performance efficiency as well as a subjective sense of wellbeing, and enhanced the efficiency of the cardiorespiratory system. The approach delineated here may be used in regular monitoring of

active duty personnel and in evaluation of the effectiveness of various therapeutic and health-promoting modalities. Figures 4; tables.

UDC 616-07:681.3

Implementation of "Konsultant-2" Medical Expert System Aboard Ships

18400566D Moscow VOYENNO-MEDITSINSKIY
ZHURNAL in Russian No 2, Feb 89 pp 49-50

[Article by G. F. Grigorenko, Honored Physician of the RSFSR, Lt. Col., Med. Corps, G. Ya. Zayats, Lt. Col., Med. Corps, A. S. Kleshchev, docent, cand. physico-mathematical sciences, A. Ya. Lifshits, cand. techn.

sciences, V. V. Samsonov, V. S. Sorokin and M. Yu. Chernyakhovskaya, cand. med. sciences]

[Abstract] Brief description is provided of the medical expert system Konsultant-2, which has been designed to facilitate diagnosis of acute abdominal conditions in seamen aboard ships. Basically, the physician interacts with the expert system in a dialogue mode for input of clinical data and retrieval of information. The system has been designed for ease of use and does not require the assistance of programmers or system operators. The time required for a diagnosis once all the clinical and laboratory data are in is one hour on a ES-1061 computer. The Konsultant-2 expert system is currently undergoing revisions and improvements in order to expand its applicability aboard navy ships.

UDC 612.017:632.4:635.25

Cybulins: Antibiotics from Onions

18400557C Moscow: PRIKLADNAYA BIOKHIMIYA I
MIKROBIOLOGIYA in Russian Vol 25, Mar-Apr 89
pp 232-245

[Article by A. P. Dmitriyev, L. A. Tverskoy, A. M. Kolesnikov, A. V. Kovtun and D. M. Grodzinskii, Institutes of Botany and of Organic Chemistry, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Conventional techniques of preparatory and analytical chemistry were employed in characterizing novel antibiotics substances isolated from onions (*Allium cepa*), designated cybulins (from Ukrainian c(ts)ybulya = onion). The cybulins have been shown to

be compounds with low molecular weights on the order of 150-500, lacking nitrogen, carboxyl groups, and aromatic residues. They have been shown to contain sulfoxide, carbonyl and hydroxyl groups and carbohydrate chains differing in length and number of double bonds. The smaller cybulins are more polar and are apparently cyclical structures. A HPLC method has been developed for their quantitative analysis, and has been used to demonstrate that in necrotic onion tissue infected with the specific pathogen *Botrytis allii* and nonspecific fungal pathogens (*B. cinerea*, *Fusarium solani*) the concentration of cybulins 1d and 2d increases 1- to 2-fold to 0.5 and 1.5 mg/g, respectively. These observations suggest that cybulins 1d and 2d are phytoalexins and may be used as markers of an active immune response. Figures 8; tables 1; references 18: 17 Russian, 1 Western.

UDC 535.379

Reinforced Chemiluminescence in Solid-Phase ELISA*18400554F Moscow BIOTEKHNOLOGIYA in Russian Vol 5 No 2, Mar-Apr 89 pp 233-239*

[Article by Ye. L. Gorovits, B. B. Kim, S. V. Vlasenko, Ye. M. Gavrilova and A. M. Yegorov, Moscow State University imeni M. V. Lomonosov]

[Abstract] Comparative analysis was conducted on solid-phase ELISA for hormones using commercial reagents (Boehringer Mannheim, FRG), relying on spectrophotometric analysis of horseradish peroxidase activity (ABTS oxidation) or reinforced chemiluminescence analysis. The latter approach is based on simultaneous oxidation of luminol and a second easily oxidized substrate, either luciferin or p-iodophenol. In the case of both competitive (T-4, T-3, digoxin, TBG) and sandwich (TSH) assays reinforced chemiluminescence was confirmed to offer the advantage of greater sensitivity, simplicity, speed of analysis, and reproducibility over spectrophotometric analysis. Figures 5; tables 2; references 12: 4 Russian, 8 Western.

UDC 543.257(088.8)

Adsorption of Microorganisms on Polarized Activated Carbon*18400557B Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 25 No 2, Mar-Apr 89 pp 184-187*

[Article by L. S. Tikhonova, M. V. Belotserkovskiy, A. Yu. Dubikaytis, S. G. Konyukhova, V. I. Strashnov and K. A. Makarov, 1st Leningrad Medical Institute]

[Abstract] An investigation was conducted on the effects of polarization of activated carbon with platinum electrode-applied current on the adsorption of *Staphylococcus albus*. The experiments were performed with activated carbon SKN-2K in 0.9% NaCl. Anodal polarization had essentially no effect on adsorption of the bacterial cells, with 43-44% adsorbed in a solution with 5.75×10^6 cells/ml. However, with cathodal polarization (-0.2 V) 95% of the live *S. albus* cells were adsorbed (decreasing the total cell concentration by 24%). In addition, adsorption of the cells retarded adsorption of the electrolyte ions, particularly in the case of cathodal polarization. Figures 2; tables 1; references 12 (Russian).

UDC 678.074:547.96

**Immobilization of Urease on Modified
Polysisoprene**

18400554C Moscow BIOTEKHNOLOGIYA in Russian
Vol 5 No 2, Mar-Apr 89 pp 202-207

[Article by A. P. Chelkin, V. N. Vasilyev, Ye. N. Zvonkova and V. I. Shvets, Moscow Institute of Fine Chemical Technology imeni 'I. V. Lomonosov]

[Abstract] Immobilization studies were conducted with watermelon urease (EC 3.5.1.5) on aminopolyisoprene prepared from commercial SKI-3 polyisoprene. The polymer was prepared by peroxidation, followed by introduction of amino groups by the Ritter reaction. The degree of covalent binding of the urease to the carrier by glutaraldehyde was dependent on the extent of epoxidation and the concentration of amino groups introduced into the polymer. Conditions favoring maximum activity of the immobilized enzyme (409 U/g carrier) were represented a degree of epoxidation of 0.73 and a 1.88% concentration of amino groups. In addition, the immobilized enzyme showed much greater thermal stability than the native urease. Figures 1; tables 2; references 11: 4 Russian, 7 Western.

UDC 577

**Nitrogen Fixation by Azospirillum Brasilense 7
Immobilized on Macroporous Carriers**

18400554D Moscow BIOTEKHNOLOGIYA in Russian
Vol 5 No 2, Mar-Apr 89 pp 208-211

[Article by L. V. Karpunina, V. Ye. Nikitina, N. A. Vorotilova, N. G. Kononova and L. K. Shatayeva, Institutes of Biochemistry and Physiology of Plants and Microorganisms (Saratov), of Chemistry and Technology of Trace Elements and Mineral Resources (Apatity), and of High Molecular Weight Compounds (Leningrad), USSR Academy of Sciences]

[Abstract] An analysis was conducted on the efficiency of nitrogen fixation by *Azospirillum brasilense* 7 immobilized on vermiculite, carbon mineral adsorbent KAS-1, and granulated vinylpyridine (VP). Highest nitrogenase activity was shown by cells immobilized on vermiculite (2.34 N₂/mg cells/day), followed by cell immobilized on KAS-1, free cells, and cells immobilized on VP. Activity on vermiculite was 3-fold higher than that of the free cells, and the activity on KAS-1 was twice as high. The activity on VP was 50% of that of the free cells. In addition, whereas cells immobilized on vermiculite retained their activity after 37 days of storage at 4°C, free cells showed complete loss of nitrogenase activity under identical conditions. These findings indicate that selected macroporous adsorbents deserve further consideration for immobilization of nitrogen-fixing bacteria. Tables 2; references 12: 8 Russian, 4 Western.

UDC 616.36-002-022:578.891]-022.3-078.73

Serologic Demonstration of Non-A, Non-B (NANB) Hepatitis Virus with Enteral Route of Transmission

18400573A Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 2, Mar-Apr 89 pp 164-167

[Article by N. V. Doroshenko, T. G. Smolina, G. K. Zairov and V. M. Stakhanova, Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] Clinical and serological studies were conducted on an outbreak of hepatitis in a region in Siberia in April, 1984, that affected 78 individuals. The majority (89%) of the patients were 19-35 year old males with a history of drinking unboiled water from a local source. The disease was mild in 90% of the cases and moderately severe in the remaining patients; there were no fatalities. Epidemiologic data pointed to enteral transmission. Serologic studies demonstrated that 80% of the patients were infected with NANB virus, while 14% were positive for hepatitis A and 6% were positive for HBsAg. The mild course and rapid recovery, as well as the electron microscopic observation of 32-35 nm virions in the fecal samples of 2 patients, which differed morphologically from previously described hepatitis A and NANB

viruses, and its serological behavior suggested a variant form of the NANB virus. Figures 1; tables 2; references 11: 6 Russian, 5 Western

UDC 616.153.962.4-097:578.828.6]-078.33

Detection of HTLV-I Antibodies in Donor Sera

18400573D Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 2, Mar-Apr 89 pp 174-176

[Article by L. S. Yakovleva, N. B. Senyuta, V. N. Stepanina, V. E. Gurtsevich, L. N. Buachidze and O. A. Korotkova, All-Union Oncological Scientific Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] Indirect immunofluorescence (IMF) and agglutination reaction were employed in monitoring Moscow blood donors for HTLV-I antibodies. Analysis of 867 sera samples yielded 39 positives with the IMF test and 12 (10 men, 2 women) by the agglutination test, with only 7 of the sera in the latter category also positive in the IMF test. However, in view of the low titers in the IMF test and previous reports questioning the specificity of this technique, adsorption tests were performed that confirmed the specificity of the agglutination test. Over half of the individuals positive in the agglutination test were 31 to 40 years old. This study revealed that 1.38% of the donors in the cohort under study were carriers of HTLV-I, raising the question whether such individuals should be excluded from serving as donors. references 15: 2 Russian, 13 Western.

UDC 575:616.912-085.371:616.36-002

**Construction of Recombinant Vaccinia Virus
Containing Pre-S2 Region Encoding Hepatitis B
Virus Surface Antigen**

18400568P Moscow DOKLADY AKADEMII NAUK
SSSR in Russian Vol 306 No 5, Jun 89 pp 1250-1252

[Article by V. I. Loparev, I. V. Mitina, R. R. Araslanov,
O. N. Ivanova, N. V. Chelyapov, V. D. Lotte and V. I.
Chernos, Moscow Scientific Research Institute of Viral
Preparations]

[Abstract] A method has been developed for the inser-
tion of a hepatitis B virus surface antigen into the outer
membrane of vaccinia virus, commencing with plasmid
pJ-S1-11K- β 2 containing DNA encoding for the pre-S2

region of hepatitis B virus. The plasmid was introduced
into primary chick embryo cells infected with the vac-
cinia virus, leading to homologous recombination
between the DNA of the plasmid and the virus [Mackett,
M. et al., J. Virol., 49:857, 1984]. DNA analysis demon-
strated that the pre-S2 DNA fragment was inserted into
the HindIII-K segment of the viral DNA. Infection of
primary chick embryonic cells with the recombinat vac-
cinia virus yielded immunoblotting data pointing to cell
synthesis of a 22 kD protein reacting with monoclonal
antibodies against the pre-S2 antigen of hepatitis virus B.
Furthermore, immunoelectron microscopy demon-
strated the pre-S2 antigen on the outer membrane on the
recombinant vaccinia virus. Consequently, this consti-
tutes the first report of a recombinant virus expressing a
foreign antigenic determinant on the virion itself. Fig-
ures 3; references 9: 1 Russian, 8 Western.

UDC [616-092:612.017.1-064]-021.5-092.9

Enhancement of HIV Infection by Monoclonal Antibodies

18400568D Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 306 No 5, Jun 89 pp 1272-1275

[Article by G. A. Ignatyeva, I. G. Sidorovich, S. Ya. Nesterchuk and I. F. Barinskiy, Institute of Immunology; Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] In vitro studies with monoclonal antibodies (IgM) directed against commercial anti-HIV monoclonal antibodies OKT4 showed that addition of the former to HIV-infected H9 cells increased HIV production two- to three-fold, as shown by the increase in HIV+ cells. Analogous studies with the addition of serum obtained from an AIDS patient exerted an inhibitory effect on HIV production in the H9 cell culture. The fact that monoclonal antibodies presumably directed against the anti-SD-4 structure may potentiate infectivity of HIV complicates the potential use of anti-HIV vaccines, particularly those that may be genetically engineered or synthetic. However, within the biotechnological context such agents may also be used for the preparation of large quantities of HIV. Tables 3; references 5 (Western).

UDC 616.98:578.891]-022.362-078.73

Evaluation of Monoclonal ELISA for HBsAg Detection in Donor and Patient Blood

18400573B Moscow VOPROSY VIRUSOLOGII in Russian Vol 34 No 2, Mar-Apr 89 pp 168-171

[Article by N. N. Sakayan, Ye. Ye. Elias, A. V. Voronov, A. B. Popova, A. M. Momot, S. M. Vorobyev, A. A. Kushch, I. B. Sushchenko, Yu. Yu. Vengerov and V. A. Ananyev, Institute of Applied Molecular Biology, USSR Ministry of Health; Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences; Blood Transfusion Station, No 6 Clinical Hospital, Moscow]

[Abstract] A monoclonal antibody-base ELISA technique for the analysis of HBsAg in donor and patients sera was compared with a number of other immunoassays. Analysis of the sera of 4375 donors revealed twice as many positive sera as were detected by passive hemagglutination, and 9- to 10-times as many positives as obtained with rocket immunoelectrophoresis. Studies on 100 patient sera yielded 91 positives with the monoclonal ELISA and 87 positives with passive hemagglutination, and also demonstrated that the former exceeded in sensitivity ELISA based on polyclonal antibody. These findings demonstrated that monoclonal antibody-based ELISA offer greater sensitivity in the detection of HBsAg than do more conventional serologic techniques. Tables 2; references 10 (Russian).

UDC 615.849.19-08.039.71

Preventing Damaging Effect of Laser Radiation

18402146 Kiev VRACHEBNOYE DELO in Russian
No 6, Jun 89, pp 104-106

[Article by I. N. Ushkova, L. A. Pokrovskaya, L. P. Rodionova, L. L. Goncharova, V. B. Dul'skiy, N. N. Kiseleva, and I. N. Makarova, Leningrad, Laboratory of Labor Hygiene, Labor Hygiene and Occupational Diseases Scientific Research Institute, and Central Scientific Research Laboratory of the Sanitary-Hygiene Medical Institute]

[Text] Diffuse reflected laser radiation is the main adverse factor at work sites associated with the production of series-produced laser units that generate radiation at a wavelength of 10.6 μm . At energy exposures that do not exceed the maximum allowable level, changes in the functional status of several organs and systems are being identified in workers, the lability of their visual analyzer is being reduced, and their hemodynamic indices are being altered. It has previously been established that the body's antioxidant system takes part in the mechanisms of both the harmful and the therapeutic effect of laser radiation (S. A. Ivanov et al., 1985; L. P. Rodionova et al., 1986).

The purpose of this article is to study the harmful effect of laser radiation and its prevention. An LGN-703 series-produced CO_2 laser with an initial output of 30 W was the radiation source. An original device consisting of a diaphragm and two parallel brass plates was used to attenuate the radiation and reflect it evenly. The research was conducted on 18 male rabbits of the chinchilla strain. The rabbits' eyes were irradiated over a period of 10 days. The power flux density on the cornea amounted to $4.2 \times 10^{-2} \text{ W/cm}^2$, with an exposure time of 71 seconds. The irradiation energy exposures were at the maximum allowable limit (Construction Norms and Specifications No. 2392-81). Biomicroscopy of the eye, with staining of the corneal epithelium with a 1% solution of sodium fluorescein (applied while the rabbits were alive), was used to assess the research results.

The intraocular pressure was measured with a Maklakov tonometer. Rheophthalmography, or ROG (L. A. Katsnelson, 1977), was used to study the filling of the vessels of the fundus of the eye with blood. In each series of tests, the animals' respiration was measured, electrocardiograms performed, and their arterial pressure measured with subsequent determination of the following indicators: respiratory rate, frequency of cardiac contractions, arterial pressure (systolic, diastolic, pulse, and mean-dynamic), duration of the sphygmoc phase, stroke and minute blood volumes, and total peripheral resistance. The effect of autonomic disorders on cardiac rhythm were studied by variation pulsometry (R. M. Bayevskiy, 1979) with a determination of the variation spread (Δx), mode amplitude, and tension index.

The functional activity of the water-soluble portion of the antioxidant system was assessed on the basis of the content in the blood and brain of reduced and oxidized forms of low-molecular thiols and reduced and oxidized forms of ascorbic acid. Superoxide dismutase, catalase, and lactate dehydrogenase activity were also determined.

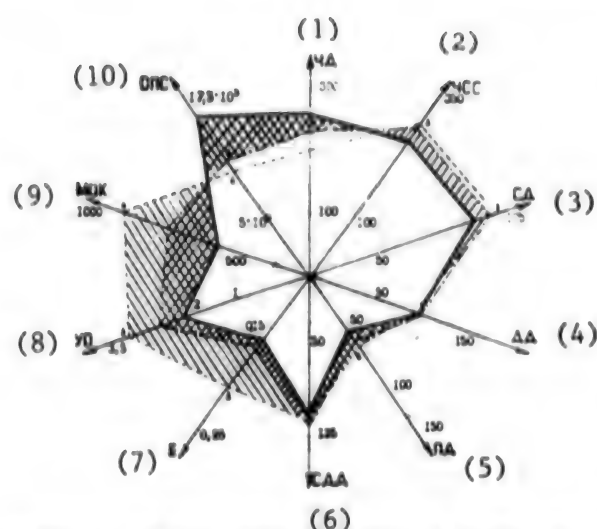
Three series of tests were conducted. Laser radiation was used daily for 10 days in the first group of animals, with a simultaneous injection of a normal saline solution (0.4 ml/kg). The group 2 animals were treated with laser radiation and intramuscular antioxidants (unithiol, 0.1 ml/kg) and ascorbic acid (0.3 ml/kg). The group 3 animals (the control group) received antioxidants only (in the same doses).

The status of the visual organs was studied 24 hours after the irradiation, on day 5, and on day 10 with a method advanced by V. V. Volkov (1972). Intraocular pressure and the filling of the vessels of the eye's fundus with blood were studied before the experiment, on day 5 of the irradiation, and after the experiment. The circulatory and antioxidant systems were studied after the conclusion of the experiment.

Eye biomicroscopy of the experimental and control animals revealed differences in the corneal membrane. The rabbits that had been subjected to the radiation had first- and second-degree corneal burns. First-degree burns (spot sections of epithelial desquamation) were detected in all of the experiment group animals after five irradiation sessions. When the duration of the laser irradiation sessions was increased to 10 days, second-degree burns (extensive confluent sections of epithelial desquamation) were detected in 50 percent of the group 1 animals who had first-degree burns of the corneal membrane and who had received saline injections. In the group 2 animals (who had received antioxidant), second-degree burns were detected in 16.6 percent of the rabbits.

The intraocular pressure did not change in any of the animals of any group over the course of the experiment. An increase in the filling with blood of the vessels of the fundi was noted in animals irradiated with the laser ($P < 0.05$). Injecting antioxidant during the laser radiation did not increase the amplitude of the pulse curve.

The data on the results of a study of systemic blood circulation (see figure) indicate that there were fundamental changes in the circulatory system. For example, laser radiation caused a consistent elevation in the frequency of cardiac contractions, systolic arterial pressure, pulse pressure, sphygmoc phase, stroke volume, minute blood volume, and total peripheral resistance ($P < 0.05$) as compared with the control group, i.e., arterial hypertension of the hyperkinetic (cardiac) type was developing. The increase in the minute blood volume was accompanied by a reduction in total peripheral resistance. The action of laser radiation of the same radiating power when an antioxidant was injected not only brought the values for the parameters studied here



Changes in the hemodynamic parameters of rabbits irradiated with a laser and given a simultaneous injection of normal saline or antioxidants. Solid line indicates the control group of animals; dashed line indicates the group 1 animals; dotted-and-dashed line indicates the group 2 animals; solid triangles indicate statistically reliable differences from the control group data ($P < 0.05$).

Key: 1. Respiratory rate—2. Frequency of cardiac contractions—3. Systolic pressure—4. Diastolic pressure—5. Pulse pressure—6. Mean dynamic pressure—7. Sphygmoc phase duration—8. Stroke volume—9. Minute volume—10. Total peripheral resistance

to a point lower than those of the rabbits in group 1, but also led to an almost complete absence of differences between them and the data of the control group.

Analysis of the variation pulsometry indicators revealed changes in the regulation of the activity of the cardiovascular system. At 4621 ± 614 , the tension index of

group 1 animals was consistently higher than in the group 2 and group 3 animals (2790 ± 388 and 2.894 ± 211 , respectively). A predominance of the sympathetic section of the autonomic nervous system in regulating cardiac activity was observed.

The action produced by the laser radiation was characterized by the redox equilibrium in the ascorbate system of the blood shifted more toward oxidation than in the initial data. For example, the ascorbic acid content in the group 1 rabbits was reduced (2.92 ± 0.43 and 5.04 ± 0.37 mg/l; $P < 0.05$), and the oxidized form was increased (6.49 ± 0.34 and 5.08 ± 0.21 mg/l; $P < 0.05$), which caused a more than twofold reduction in the ascorbate redox coefficient. Statistically reliable reductions in the lactate dehydrogenase activity of the blood (161.0 ± 12.4 and 202.5 ± 7.6 nmol/g/s) and in the superoxide dismutase activity (26.6 ± 1.8 and $32.6 \pm 1.2\%$) were also noted. The blood's thiol disulfide system maintained its stability. These changes can be considered signs of a reduction in antioxidant system activity.

Injecting an antioxidant for preventive purposes results in an inverse change in the redox equilibrium in the ascorbate system toward a reduction as a consequence of a pronounced tendency toward an increase in the content in the forms of ascorbic acid by 36% and 46% and a reduction of the oxidized form by 9% and 17% for the blood and brain tissue, respectively, with the ascorbate redox coefficient increasing 1.5-fold (see table). Analogous but less pronounced disturbances were observed in the low-molecular fraction of the thiols of the rabbits' blood and brains. Also noticed was a statistically reliable increase in the lactate dehydrogenase activity in the blood and brain tissue. The activity of the antiperoxide enzymes of the superoxide dismutase and catalase was reduced in the brain tissue, but remained virtually unchanged in the blood when compared with the indicators of those animals subjected to the effect of laser radiation without injection of an antioxidant.

Table

Indicator	Blood		Brain	
	Group 1	Group 2	Group 1	Group 2
Ascorbic acid, $\mu\text{g/g}$	2.92 ± 0.43	3.98 ± 0.97	51.0 ± 7.9	75.7 ± 9.6
Oxidized form, $\mu\text{g/g}$	6.49 ± 0.34	5.91 ± 0.68	53.5 ± 4.8	44.4 ± 4.8
Ascorbic acid/oxidized form	0.45	0.67	0.95	1.70
SH, mmol/l·g	1.16 ± 0.03	1.19 ± 0.03	1.05 ± 0.05	1.17 ± 0.09
SS, mmol/l·g	0.38 ± 0.02	0.37 ± 0.02	0.44 ± 0.04	0.44 ± 0.03
SH/SS	3.05	3.22	2.39	2.66
Lactate dehydrogenase, $\mu\text{mol/s·g}$	0.16 ± 0.01	0.22 ± 0.01	4.30 ± 0.20	8.32 ± 0.60
Superoxide dismutase, % inhibition	26.6 ± 1.8	25.3 ± 2.7	72.1 ± 2.0	64.5 ± 2.9
Catalase, mmol/s·g	0.62 ± 0.03	0.63 ± 0.03	71.4 ± 7.6	55.9 ± 3.9

The data obtained confirm the concept of the effect of laser radiation on processes of free-radical oxidation and the antioxidant mechanisms regulating it (V. V. Sokolovskiy, 1984). The changes in the ascorbate redox coefficient toward the oxidation side and the reduction in superoxide dismutase and lactate dehydrogenase activity may be due to the effect of free-radical oxidation products (Rayner et al., 1983).

The prophylactic injection of antioxidants compensating for the insufficiency of antiradical protection of the superoxide dismutase by activating the ascorbate and thiol disulfide systems makes it possible to preserve the erythrocytes' lactate dehydrogenase. Since the metabolic processes in erythrocytes reflect the changes occurring in the body under various effects (V. I. Shepotinovskiy, 1984), correcting the energy metabolism of these cells evidently increases the body's adaptive capabilities. This may be one of the reasons for the reduction in the damaging effect of the laser radiation.

Thus, the first- and second-degree burns of the rabbits' corneas, the increase in blood in their fundi, the development of cardiac-type arterial hypertension (the basis of which consists of the changes in the regulation of cardiac activity), and the decrease in the activity of the blood's antioxidant system indicate the adverse effect of laser radiation and the reduction in the body's adaptive capabilities, the basis of which is probably not only the local thermal effect, but also the body's reflex response to the stimulation of numerous nerve ends of the branches of the trigeminal nerve, with its transmission to the visual tuber, with subsequent realization through the cerebral cortex and subcortex in the form of general reactions of the body. The correction of the indicated changes when an antioxidant is injected confirms the role of redox processes in the mechanism of the injurious effect of radiation from a CO₂ laser.

The data presented may be used when developing preventive measures geared toward increasing the nonspecific resistance of the body of those working under conditions associated with laser radiation.

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Automated Health Scanning Device

18402098 Moscow *MEDITSINSKAYA GAZETA*
in Russian 23 June 89 p 1

[unattributed TASS article: "The 'ASPO' Health Conveyor Line"]

[Text] One can now undergo a medical preventive examination in one and one-half hours instead of two weeks. That has been made possible by the ASPON-90 automated complex, which was built by scientists and engineers of the temporary scientific creative collective "Sistema."

Three years ago technological progress enthusiasts from Minsk, Moscow, and Leningrad set out to design an intelligent system capable of performing mass health screening without the participation of physicians. That project has now been completed. Testing of the first two models of the new device has begun in Moscow and Leningrad.

The people in the registration office produce not a "trail" of paper, but rather a magnetic chart or small box, i.e., an

electronic unit that is placed into the receptacle of the instrument that examines us. Computers write the collected information into the memory of this device. The next visit is to a personal computer. It asks questions like those on a questionnaire, regarding living conditions, working conditions, and state of health. Answers to these questions are given by pressing a button. After this "conversation," the box with the recorded information is removed. Blood analysis takes place in the laboratory, and although the analysis is called automatic, we are met by a nurse who pricks our finger in the old-fashioned way. This procedure could also be mechanized, but the inventors considered a psychological factor here, i.e., not everyone would be brave enough to entrust his finger to a mechanical "perforator." Besides, that ends the archaic aspect of the procedure. The blood analysis is done by a computer. The next office to be visited is the electrocardiography room. The instruments operate in an automated mode, so the time losses are minimal. Arterial pressure is measured with equal speed, as are respiratory functions. However, we shall not enumerate everything that is included in this system, since up to 600 functional parameters of the body are measured.

UDC 576.8.094.83

Chemical Nature of Black Pigment in *Exophiala Nigrum*

18400557D Moscow *PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA* in Russian Vol 25 No 2, Mar-Apr 89 pp 272-277

[Article by V. V. Pavlenko and G. G. Ivanova, Scientific Research Institute of Biology, Irkutsk State University]

[Abstract] Chemical and biochemical studies were conducted on the black yeast *Exophiala nigrum* isolated from the shores of Lake Baikal in 1977 in order to ascertain the nature of the black pigment. The studies led to the identification of the pigment as a melanin-like substance. In addition, in most of the studies treatment of the yeasts with inhibitors of tyrosinase retarded yeast growth the pigment production. These observations further confirmed the importance of the enzyme in *E. nigrum* viability, with the degree of pigmentation evidently reflecting resistance to adverse environmental factors and UV light. Figures 1; tables 2; references 12: 11 Russian, 1 Western.

UDC 356.33:614.4(479.25)

Military Sanitary, Hygienic, and Antiepidemic Measures in Earthquake Disaster Areas*18400566A Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 2, Feb 89 pp 11-13*

[Article by I. S. Konyshov, Lt. Col., I. M. Khomenko, Lt. Col., and V. I. Shishmintev, Lt. Col., Medical Corps]

[Abstract] An analysis was conducted on the measures taken by the military under the disaster conditions prevalent in Armenia following the 1988 earthquake. The actual performance and that time demonstrated that sanitary and hygienic oversight over military personnel dispatched to a natural disaster area should be divided into three basic stages. The first stage consists of efforts directed at water treatment and disinfection, removal of debris, and billeting of troops. The second stage deals with ensuring adequate and proper food provisions for the troops, proper sanitary facilities, disposal of victims of the earthquake, vaccination, rat control, phage treatment for the control of typhoid fever, and other general measures aimed at securing elementary sanitary control over the area. The third stage emphasizes the availability of safe drinking water, and adequate food and clothing with regard to the ambient conditions. Throughout there is need for careful monitoring of drug supplies, disinfectants, and close cooperation and coordination of efforts with local health authorities and other health departments.

UDC 616-001.4-07.616.1/4-07

Functional and Morphologic Changes in Internal Organs Following Land Mine Explosion-Induced Injuries*Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 2, Feb 89 pp 19-21*

[Article by V. Khabibi, chief, Central Military Hospital, Afghan Ministry of Defense; Major General, Medical Corps; and P. O. Vyazitskiy, professor, Lt. General, V. I. Komarov, docent, Col., N. P. Minnullin, cand. med. sci., Lt. Col., A. A. Storozhenko, docent, Col., and L. V. Likhachev, Lt. Col., Medical Corps]

[Abstract] Detailed studies were conducted by Afghan and Soviet clinicians on the changes in the structure and function of internal organs resulting from injuries sustained as a result of land mine explosions. Analysis of 237 cases showed that 22.6% of the patients developed pneumonia, generally within 15 days of the trauma in 85% of the cases. Secondary changes in the myocardium of patients dying within one to two days consist of myofibril fragmentation, edema, leukocytic and lymphocytic infiltrates, swollen myocytes, thrombogenesis, etc. The inflammatory and dystrophic changes found manifestation in various degree of cardiac insufficiency with more or less pronounced changes on the EKG. In addition, in 31.2% of the more serious cases pericarditis developed, and one fatal case presented with endocarditis. The majority of patients also presented with severe post-traumatic nephropathy. In 8.3% of the cases acute renal insufficiency developed following severe blood loss, hypotension, and shock. The gastrointestinal system was characterized by extensive hemorrhages and erosions in some 3.7% of the cases. However, in 84% of such cases the ulcerative process was asymptomatic. Hepatic changes were extensive although functional changes were minimal and usually seen as elevation of total blood bilirubin and depressed prothrombin production. Both edema and hyperemia may be evident in the pancreas, with occasional development of acute pancreatitis and functional insufficiency. Accordingly, special concern should be shown for possible internal organ pathology during convalescence and rehabilitation of victims of land mine explosions.

UDC 612.452.018.06:613.863].06:612.822.018:577.175.82

Effect of N-Terminal Fragment of Substance P₁₋₄ (NSP) on Somatic Manifestation of Stress and Adrenal Catecholamine Levels in Rats

18400564B BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY, Vol 107 No 2, Feb 89 pp 201-204

[Article by V. A. Arefolov, L. A. Malikova, A. V. Valdman, K. Niber and P. Oehme [Eome], Institute of Pharmacology, USSR Academy of Medical Sciences, Moscow; Institute of Physiologically Active Substances, GDR Academy of Sciences, Berlin]

[Abstract] Outbred male rats (ca. 200 g) were used in studies on the antistress effects of NSP in a model system consisting of immobilization. The animals were immobilized for either 1 h or 48 h. NSP was administered in four daily doses of 100 µg/kg/day in the 1 h experiment, and twice before and twice during the 48 h experiment. One hour of immobilization caused a statistically significant reduction in the weight of the thymus and the spleen, and an insignificant reduction in the weight of the adrenal gland. Pretreatment with NSP limited the weight loss of the thymus and the spleen to statistically insignificant levels, while promoting an insignificant increase in the weight of the adrenal gland. In the 48 h study the loss of thymic and splenic weight was more pronounced than in the 1 h experiment, while adrenal weight was elevated to more than twice the control weight. Management of the rats in the latter experiment with NSP attenuated the degree of thymic and splenic weight loss, but the loss remained statistically significant. In this case NSP had no telling effect on the gain in adrenal weight. In addition, whereas the gastric mucosa in the 1 h rats was unaltered, in the 48 h rats ulceration and hemorrhages were evident, with partial alleviation seen in the 48 h NSP-treated rats. Ultrastructural and cytochemical studies on the adrenals also revealed that stress induced depletion of adrenal catecholamine stores, a situation partially reversed by the administration of NSP. These observations demonstrated the importance of the NSP fragment in mitigating the effects of stress, with at least a part of the effect attributed to preservation of adrenal catecholamine reserves. Figures 1; tables 2; references 9: 2 Russian, 7 Western.

UDC 612.82.015.1:577.152.34].014.46.08

Effects of Tuftsin on Leucyl Aminopeptidase (LAP) Activity of Subcellular Cortical Components

Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 107 No 2, Feb 89 pp 209-211

[Article by A. S. Kamysheva, Cytochemistry Laboratory, Brain Institute, All-Union Scientific Center of Mental Health, USSR Academy of Medical Sciences, Moscow]

[Abstract] Continuing studies on the biological spectrum of tuftsin led to an investigation of its effects on LAP activity in the sensorimotor and visual cortex of Chinchilla rabbits. Determinations of enzymatic activity were conducted 15 and 75 min after intraperitoneal injection of 300 µg/kg tuftsin. Control determinations demonstrated that baseline activities were generally higher in the sensorimotor cortex than in the visual cortex, and were highest in the light synaptosomes and lowest in mitochondria. Within 15 min of tuftsin administration LAP activities diminished in both cortical areas, but more so in the synaptosomes than in the mitochondria. After 75 min mitochondrial LAP activities increased to almost control levels in both cortical areas. LAP activity in sensorimotor synaptosomes remained significantly below control baseline, but exceeded baseline levels of activity in the visual synaptosomes. These findings demonstrated that the effect of tuftsin on the CNS involve protein metabolism at the subcellular as well as the cellular level. Figures 3; references 15: 7 Russian, 8 Western.

UDC 615.275.4.015.4:612.40].076.9

Effects of Tactivin on Diuresis and Excretion of Cardiotrast (Diodrast)

18400575A Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 107 No 3, Mar 89 pp 264-266

[Article by V. Ya. Arion, Ye. B. Berkhin, G. I. Galyuteva, G. P. Ulyanov and I. V. Sanina, Scientific Research Institute of Physicochemical Medicine, RSFSR Ministry of Health; Chair of Pharmacology, Altay Medical Institute imeni Lenin's Komsomol, Barnaul]

[Abstract] In view of the fact that various immunomodulators have been shown to affect renal function, outbred rats were employed to assess the effects of tactivin on diuresis and Diodrast excretion. Subcutaneous administration of 20 µg/kg tactivin for 6 days had no effect on diuresis nor on excretion of sodium, potassium, creatinine, or uric acid. Although the glomerular filtration rate was not affected by tactivin, excretion of Diodrast was increased by 21% during tactivin administration. Diodrast excretion fell to baseline levels after tactivin administration was discontinued. In this respect tactivin shares the activities of other immunostimulants in favoring elimination of low MW xenobiotics, although the exact mechanisms of action remain undefined. Figures 1; tables 2; references 11: 10 Russian, 1 Western.

UDC 591.089.84.612.8

Recovery of Hypoxia-Induced Perturbation of Blood-Brain Barrier by Transplantation of Embryonal Nervous Tissue*18400568A Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 306 No 5, Jun 89 pp 1242-1246*

[Article by I. N. Saburina, Institute of General Genetics imeni N. I. Vavilov, USSR Academy of Sciences, Moscow]

[Abstract] The fact that transplantation of syngeneic nervous tissue from embryos into homotopic sites of adult animals has a variety of physiological and anatomical sequelae led to an analysis of the effects of such transplantation on the blood-brain barrier (BBB). Mature Wistar rats (150-170 g) were subjected to 3 min of acute hypoxic hypoxia. After 7 days cortical tissue from 17 day old was transplanted into a prepirietal area in the mature rats, while another group of mature rats were sham operated. Fluorescence microscopic assessment of extravasation of labeled globulins demonstrated that an episode of hypoxic hypoxia and the sham operation led to an increase in permeability of the BBB within one day, a change that persisted for one month. The latter period of time was sufficient for the launching of an immune response against CNS antigens. Transplantation led to complete restoration of BBB patency within two weeks, i.e., prior to the onset of a primary autoimmune response as a result of the lesion, thereby maintaining the privileged nature of the CNS and preventing autoimmune damage. Figures 2; references 12: 6 Russian, 6 Western.

UDC 612.822.3

Comparative Analysis of Effects of Synthetic SKD Peptide, Vasopressin and Aspartic Acid on Electric Sensitivity of Sodium and Potassium Channels of Somatic Membrane of Neurons*18400568C Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 306 No 5, Jun 89 pp 1269-1271*

[Article by N. Yu. Artemyev, Yu. A. Darinskiy, D. V. Dorin and G. I. Chipens, academician, Latvian SSR Academy of Sciences, Leningrad State Pedagogical Institute imeni A. I. Gertsen; Institute of Organic Synthesis, USSR Academy of Sciences, Latvian SSR Academy of Sciences, Riga]

[Abstract] An analysis was conducted on the effects of the SKD protein, vasopressin, and aspartic acid on the sodium and potassium channels of the neurons of the mollusk *Lymnaea stagnalis*. In a concentration of 10^{-15}

M SKD showed maximum reduction of I_{Na} to 75.4% of control value, while 10^{-7} M SKD increased the amplitude by 33.6%. In a concentration range of 10^{-17} to 10^{-6} M SKD inhibited I_K in a dose-dependent fashion. Vasopressin inhibited the sodium currents in a dose-dependent manner in the concentration range of 10^{-16} to 10^{-6} M, while aspartic acid was without effect on the sodium channels up to a concentration of 10^{-3} M. Vasopressin required a concentration of 10^{-8} to 10^{-6} M for an inhibitory effect on the potassium channels, while aspartic acid did not diminish potassium currents until it was raised to 10^{-3} M concentration. This is the first report of a marked effect of SKD on ion channels of neurons, indicating that it may alter the pattern of neuronal discharges toward a higher firing frequency. Figures 1; references 12: 9 Russian, 3 Western.

UDC 616.441-008.64-092.9-085.835.3-036.8-07

Management of Experimental Hypothyroidism with Hyperbaric Oxygenation*18400575B Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 107 No 3, Mar 89 pp 285-288*

[Article by N. V. Shakarashvili, I. L. Zhidkov, Yu. B. Koloskov, V. G. Teplyakov, V. I. Dedov, Ye. A. Demurov and S. N. Yefunin, Department of Hyperbaric Oxygenation, All-Union Scientific Research Center for Surgery, USSR Academy of Medical Sciences, Moscow]

[Abstract] An analysis was conducted on the physiological effects of hyperbaric oxygenation in experimental hypothyroidism, in order to elucidate the mechanisms responsible for its efficacy in management of hypothyroidism a complication of thyroid resection. Hypothyroidism was induced in 2.5-3 kg male chinchilla rabbits by administration of ^{131}I , with the experimental animals treated with hyperbaric oxygenation on a daily basis for 40 min under 1.7 atm for ten days. Experimental hypothyroidism, confirmed histologically, was accompanied by diminished myocardial contractility, depressed myocardial lipid peroxidation, and diminished blood flow in the skeletal muscles and the thyroid gland. Hyperbaric oxygenation reversed the pathophysiologic manifestations of hypothyroidism. In addition, histologic studies demonstrated the protective effects of hyperbaric oxygenation on the myocardium with retention of normal histologic relationships. However, hyperbaric oxygenation exerted no effect on the levels of the thyroid hormones or thyrotropin. The positive effects of hyperbaric oxygenation may have been due to enhancement of metabolic processes and microcirculatory parameters, and possible enhancement of receptor sensitivity to thyroid hormones. Figures 3; tables 1; references 3: 2 Russian, 1 Western.

UDC 615.12:008(476)

Perestroyka in Pharmaceutical Services

*18400559A Moscow FARMATSIYA in Russian Vol 38
No 2, Mar-Apr 89 pp 1-4*

[Article by S. G. Shamruk, Main Pharmacy Administration, Belorussian SSR Ministry of Health, Minsk]

[Abstract] The current method of administration in the various branches of pharmaceutical services is established on a paramilitary command-type model, an approach known to negate economic considerations and efficiency. In Belorussia the services are overstaffed, inefficient, and uneconomical due in large measure to

the lack of accountability that this type of administrative structure engenders. The pharmaceutical establishment in Belorussia is in dire need of transformation of the type represented by the current perestroyka movement in order to improve productivity, become cost-effective, and attain economic viability. Certain of the changes shall involve strict controls over those entitled to free medications, e.g., veterans of the Great Patriotic War. In the future free drugs shall only be available to children and certain categories of patients, such as those suffering from diabetesm tuberculosis, cancer, etc. In addition, efforts shall be made to ensure more efficient use of drugs in hospitals, and drug reimbursement programs should be placed under the aegis of social services as they are in the majority of other countries.

UDC 615.31.03:616-001.28-084].015.4:616.419-008.939.6:577.113.3].076.9

Effects of Radioprotective Agents on Bone Marrow Levels of Cyclic Nucleotides in Rats

18400564A Moscow *BYULLETEN*

EKSPERIMENTALNOY BIOLOGII I MEDITSINY

in Russian Vol 107 No 2, Feb 89 pp 191-193

[Article by N. B. Pushkareva, A. V. Nikolskiy, A. N. Koterov and I. V. Filippovich, Institute of Biophysics, USSR Ministry of Health, Moscow]

[Abstract] The observation that elevation of cAMP was related to radioprotection led to an analysis of the effects of 17 radioprotective agents on bone marrow levels of cAMP and cGMP in (CBA x C58 Black) F_1 male mice in relation to 30 day survival rates after gamma irradiation. The animals were irradiated with a minimal lethal dose (232.2 mCoulombs/kg) after intraperitoneal administration of the agents. The resultant data showed that efficacious agents specifically led to elevation of the cAMP/cGMP ratio in the bone marrow, irrespective of whether the mechanism involved elevation of cAMP or depression of cGMP. Furthermore, dose-effect relationships demonstrated that radioprotective doses were related to the cAMP/cGMP ratio. Highly effective agents (cysteamine HCl, isoproterenol HCl, fetanol HCl) in proper doses induced elevation of the cAMP/cGMP ratio by 170-200% and yielded survival rates of 55-60%. Moderately effective agents induced cAMP/cGMP ratios of 130-140% accompanied by survival rates of 25-42%. In general, irradiation was shown to prevent a rise in the cAMP/cGMP ratio when the agents were administered after irradiation. A moderate radioprotective effect was seen only with cysteamine given 2 min after irradiation, which was correlated with a slight elevation of cAMP/cGMP ratio. Figures 3; tables 1; references 8: 3 Russian, 5 Western.

UDC 577.391.612.419

Explantation, Incubation, and Reinfusion of Bone Marrow Cells in the Treatment of Acute Radiation Sickness in Several Animal Species

18400604A Moscow *RADIOBIOLOGIYA* in Russian

Vol 29 No 2, Mar-Apr 89 pp 158-163

[Article by L. M. Rozhdestvenskiy, Ye. N. Shcherbova and V.N. Limarenko, Institute of Biophysics, USSR Ministry of Health, Moscow]

[Abstract] Therapeutic trials were conducted with the explantation, incubation and reinfusion (EIR) of bone marrow cells in mice, dogs, rats and guinea pigs following 3.6 to 9.0 Gy gamma irradiation. Following removal, the cells were incubated for 1 to 6 h in medium 199, in some cases supplemented with cycloheximide (10 μ g/ml). Evaluation of the 30-day survival times (45 days in dogs) demonstrated various degrees of beneficial

effects of the EIR procedure, depending on the incubation conditions and the species involved. For example, whereas the control survival rate in male (CBA x C57Bl) F_1 mice was 11.3%, EIR increased the figure to 59.0%, while inclusion of cycloheximide improved the survival rate to 70.9%. In addition, 36°C represented the optimum incubation temperature. The data were interpreted to indicate that the EIR procedure enhanced stem cell recovery and, especially the differentiation of the cells into the granulocytic series. Figures 1; references 15. 11 Russian, 4 Western.

UDC 578.833.1.083.33

Monoclonal Antibodies Against Crimean Hemorrhagic Fever Virus (CHFV)

18400573F Moscow *VOPROSY VIRUSOLOGII*

in Russian Vol 34 No 2, Mar-Apr 89 pp 201-204

[Article by S. Ya. Gaydamovich, Ye. E. Melnikova, T. M. Shutkova, A. S. Novokhatskiy, A. L. Turchinskaya and V. M. Zhdanov (dec), Institute of Virology imenin D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] Conventional methodology was employed in inducing monoclonal antibodies against CHFV [Kohler, G., and Milstein, C., *Europ. J. Immunol.*, 6: 511-519, 1976], and in assessing the nature of the immunoglobulins. The hybrid cell lines multiplied actively in vitro and in the peritoneal cavity of BALB/c mice. Testing of the antibodies by a variety of conventional immunochemical techniques demonstrated that only one of the 44 clones produced IgM monoclonal antibodies, the remaining hybridomas producing several subclasses of IgG. In radial gel precipitation studies the titers generally did not exceed 1:32, with the exception of one clone that produced antibodies in a titer of 1:256. Behavior of the antibodies in routine serologies was conventional. None of the monoclonal antibodies possessed neutralizing activity vis-a-vis CHFV. However, the majority of the monoclonal antibodies generated by the techniques employed in this study were specific against the species-specific antigenic determinant of the CHFV-Congo group. Tables 2; references 12: 5 Russian, 7 Western.

UDC 615.371:578.833.26].015.46.076.9

Immune Response in Mice Immunized with Inactivated Lassa Virus

18400573G Moscow *VOPROSY VIRUSOLOGII*

in Russian Vol 34 No 2, Mar-Apr 89 pp 213-216

[Article by G. M. Ignatyev, V. P. Golubev, A. T. Godneva, A. S. Petkevich, A. V. Torop, N. N. Lemeshko, I. S. Lukashevich and V. P. Rytik, Belorussian Scientific Research of Epidemiology and Microbiology, Belorussian SSR Ministry of Health, Minsk]

[Abstract] An analysis was conducted on the nonspecific (NK cell and interferon) and specific immune factors in

the immune response to gamma radiation-inactivated Lassa virus in 14-18 g CBA mice. The study revealed that within the first 14 days of infection titers of NK cells and interferon show a modest rise and may offer some immune protection in that period of time against infection with a homologous virus. At that time titers of specific antibody were low, with neutralization indices of 0.8 and 1.1 log on days 7 and 14, respectively. The greatest degree of immune protection was shown to be due to the appearance of immunocompetent cells by day 14, the transfer of which to syngeneic recipients offered virtually complete immunity (p) appearance of these cells and the blast response with the Lassa virus. Tables 3; references 20: 9 Russian, 11 Western.

UDC 578.833.26:578.5].04:547.495.2/.4].08

Interference Induction and Urea Inactivation of Machupo Viruses

18400573I Moscow VOPROSY VIROLOGII in Russian Vol 34 No 2, Mar-Apr 89 pp 237-240

[Article by N. M. Trofimov, N.I. Yerofeyeva, B. I. Zudin, L. Ye. Surikova and A. S. Petkevich, Belorussian Scientific Research Institute of Epidemiology and Microbiology, Belorussian SSR Ministry of Health, Minsk]

[Abstract] An analysis was conducted on the relationship between interferon induction and inactivation by urea of several Machupo viruses differing in virulence for guinea pigs. An inverse relationship prevailed between the parameters of interest. The standard Machupo virus was shown to be the weakest inducer of interferon in outbred mice on intracerebral injection, yielding maximum

interferon titers of 80 IU₅₀/0.1 ml 5-7 days after injection, and displayed considerable resistance to inactivation by 3 M urea (37°C for 12 min). Machupo virus clones No 1 and 2 induced maximum interferon titers of 320 IU₅₀/0.1 ml on day 3, in combination with much greater susceptibility to urea than the standard virus. It appears, therefore, that these criteria may be used in assessing the degree of attenuation of Machupo viruses. Figures 1; tables 1; references 11: 5 Russian, 6 Western.

UDC 615.371:578.832.1].015.46.07

Enhanced Immunogenicity of Liposome-Borne Influenza Virus Hemagglutinin

18400573J Moscow VOPROSY VIROLOGII in Russian Vol 34 No 2, Mar-Apr 89 pp 237-240

[Article by R. I. Ishbayeva, A. A. Gulyako, A. N. Simonov, I. Kleppish, A. M. Makhov and I. G. Kharitonov, Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] Outbred mice, 18-20 g, were immunized with liposomes bearing the hemagglutinin fraction isolated from influenza virus A/Leningrad/385/80 (H2N2) as part of a vaccine development study. Incorporation of the hemagglutinin into the bilayer lipid membrane had no adverse effect on hemagglutinating activity and immunogenicity. Serum antibody determinations showed that intraperitoneal immunization with 0.2 ml liposomal suspension results in titers some 16-fold higher than those obtained when hemagglutinin was used for immunization, and equivalent to those obtained with intact viruses. In addition, the hemagglutinin-bearing liposomes remained stable for 8 months at 4°C in phosphate buffer, pH 7.4, with full retention of antigenicity and immunogenicity. Figures 2; tables 1; references 15: 9 Russian, 6 Western.

UDC 615.849.19.03:617-089.75(47+57)

Lasers in Medical Practice

18400566E Moscow VOYENNO-MEDITSINSKIY
ZHURNAL in Russian No 2, Feb 89 pp 79-80

[Article by A. P. Belokopytov, cand. techn. sciences,
colonel]

[Abstract] The increasing importance of lasers in clinical medicine led to an interdepartment workshop entitled "Prospects for New Laser Instruments and Novel Uses of Lasers in Medical Specialties" held in Vladivostok, 25-29 September 1988. The participants, representing various research establishments, dealt with the scope of laser application in clinical medicine,

laser mechanisms of action, and design of improved laser beam delivery instruments. Research done to date has provided unequivocal proof that laser action may exert analgesic, anti-inflammatory, and stimulating actions. Argon lasers have been shown to effective in the management of osteoarthritis and rheumatoid arthritis in 85.7% of the cases, helium-neon lasers in 82.1%, yellow liquid lasers in 89.6%, and infrared lasers in 87.5% of the cases. Recent developments have shown that combined magnetolaser therapy appears to represent a novel approach that has been shown to be very promising in the treatment of 115 patients with osteoarthritis. Recent advances have also seen the development of a the Raduga-1 endoscopic laser and an advanced form of the well-established surgical laser Skalpel-3.

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